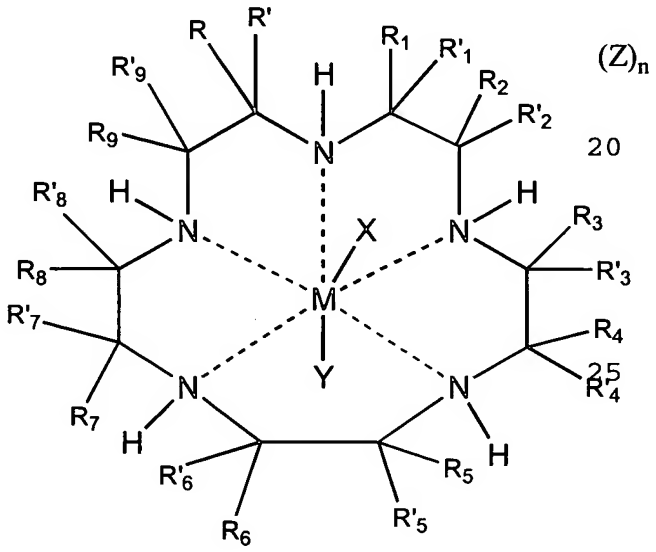
WHAT IS CLAIMED IS:

1. A modified biopolymer comprising a biopolymer chosen from the group consisting of chitin, chitosan, cellulose, methyl cellulose, hyaluronic acid, keratin, fibroin, collagen, elastin, and saccharide polymers attached to at least one non-proteinaceous catalyst capable of dismutating superoxide in the biological system or precursor ligand thereof.

2. The modified biopolymer of claim 1, wherein the non-proteinaceous catalyst capable of dismutating superoxide in the biological system is selected from the group consisting of manganese and iron chelates of pentaazacyclopentadecane compounds, which are represented by the following formula:



wherein M is a cation of a transition metal, preferably manganese or iron; wherein R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 independently represent hydrogen, or substituted or unsubstituted alkyl, alkenyl, alkynyl, cycloalkyl, cycloalkenyl, cycloalkylalkyl, cycloalkylcycloalkyl, cycloalkenylalkyl, alkylcycloalkyl, alkylcycloalkenyl,

alkenylcycloalkyl, alkenylcycloalkenyl, heterocyclic, aryl and aralkyl radicals; R_1 or R'_1 and R_2 or R'_2, R_3 or R'_3 and R_4 or R'_4, R_5 or R'_5 and R_6 or R'_6, R_7 or R'_7 and R_8 or R'_8, and R_9 or R'_9 and R or R' together with the carbon atoms to which they are attached independently form a substituted or unsubstituted, saturated, partially saturated or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms; R or R' and R_1 or R'_1, R_2 or R'_2 and R_3 or R'_3, R_4 or R'_4 and R_5 or R'_5, R_6 or R'_6 and R_7 or R'_7, and R_8 or R'_8 and R_9 or R'_9 together with the carbon atoms to which they are attached independently form a substituted or unsubstituted nitrogen containing heterocycle having 2 to 20 carbon atoms, provided that when the nitrogen containing heterocycle is an aromatic heterocycle which does not contain a hydrogen attached to the nitrogen, the hydrogen attached to the nitrogen as shown in the above formula, which nitrogen is also in the macrocyclic ligand or complex, and the R groups attached to the included carbon atoms of the macrocycle are absent; R and R', R_1 and R'_1, R_2 and R'_2, R_3 and R'_3, R_4 and R'_4, R_5 and R'_5, R_6 and R'_6, R_7 and R'_7, R_8 and R'_8, and R_9 and R'_9, together with the carbon atom to which they are attached independently form a saturated, partially saturated, or unsaturated cyclic or heterocyclic having 3 to 20 carbon atoms; and one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 together with a different one of R, R', R_1, R'_1, R_2, R'_2, R_3, R'_3, R_4, R'_4, R_5, R'_5, R_6, R'_6, R_7, R'_7, R_8, R'_8, R_9, and R'_9 which is attached to a different carbon atom in the macrocyclic ligand may be bound to form a strap represented by the formula

$$-(CH_2)_x-M-(CH_2)_w-L-(CH_2)_z-I-(CH_2)_y-$$

wherein w, x, y and z independently are integers from 0 to 10 and M, L and J are independently selected from the group consisting of alkyl, alkenyl, alkynyl, aryl,

cycloalkyl, heteroaryl, alkaryl, alkheteroaryl, aza, amide, ammonium, oxa, thia, sulfonyl, sulfinyl, sulfonamide, phosphoryl, phosphinyl, phosphino, phosphonium, keto, ester, alcohol, carbamate, urea, thiocarbonyl, borates, boranes, boraza, silyl, siloxy, silaza and combinations thereof; and combinations thereof;

and wherein X, Y and Z are independently selected from the group consisting of halide, oxo, aquo, hydroxo, alcohol, phenol, dioxygen, peroxo, hydroperoxo, alkylperoxo, arylperoxo, ammonia, alkylamino, arylamino, heterocycloalkyl amino, heterocycloaryl amino, amine oxides, hydrazine, alkyl hydrazine, aryl hydrazine, nitric oxide, cyanide, cyanate, thiocyanate, isocyanate, isothiocyanate, alkyl nitrile, aryl nitrile, alkyl isonitrile, aryl isonitrile, nitrate, nitrite, azido, alkyl sulfonic acid, aryl sulfonic acid, alkyl sulfoxide, aryl sulfoxide, alkyl aryl sulfoxide, alkyl sulfenic acid, aryl sulfenic acid, alkyl sulfinic acid, aryl sulfinic acid, alkyl thiol carboxylic acid, aryl thiol carboxylic acid, alkyl thiol thiocarboxylic acid, aryl thiol thiocarboxylic acid, alkyl carboxylic acid (such as acetic acid, trifluoroacetic acid, oxalic acid), aryl carboxylic acid (such as benzoic acid, phthalic acid), urea, alkyl urea, aryl urea, alkyl aryl urea, thiourea, alkyl thiourea, aryl thiourea, alkyl aryl thiourea, sulfate, sulfite, bisulfate, bisulfite, thiosulfate, thiosulfite, hydrosulfite, alkyl phosphine, aryl phosphine, alkyl phosphine oxide, aryl phosphine oxide, alkyl aryl phosphine oxide, alkyl phosphine sulfide, aryl phosphine sulfide, alkyl aryl phosphine sulfide, alkyl phosphonic acid, aryl phosphonic acid, alkyl phosphinic acid, aryl phosphinic acid, alkyl phosphinous acid, aryl phosphinous acid, phosphate, thiophosphate, phosphite, pyrophosphite, triphosphate, hydrogen phosphate, dihydrogen phosphate, alkyl guanidino, aryl guanidino,

alkyl aryl guanidino, alkyl carbamate, aryl carbamate, alkyl aryl carbamate, alkyl thiocarbamate aryl thiocarbamate, alkyl aryl thiocarbamate, alkyl dithiocarbamate, aryl dithiocarbamate, alkyl aryl dithiocarbamate, bicarbonate, carbonate, perchlorate, chlorate, chlorite, hypochlorite, perbromate, bromate, bromite, hypobromite, tetrahalomanganate, tetrafluoroborate, hexafluorophosphate, hexafluoroantimonate, hypophosphite, iodate, periodate, metaborate, tetraaryl borate, tetra alkyl borate, tartrate, salicylate, succinate, citrate, ascorbate, saccharinate, amino acid, hydroxamic acid, thiotosylate, and anions of ion exchange resins.

3. The modified biopolymer of claim 2, wherein the biopolymer is hyaluronic acid.

4. The modified biopolymer of claim 2, wherein the biopolymer is an ester of hyaluronic acid.

5. The modified biopolymer of claim 4, wherein the ester of hyaluronic acid is chosen from the group consisting of total esters and partial esters.

6. The modified biopolymer of claim 4, wherein the ester of hyaluronic acid is a benzyl ester.

7. A thread comprising the modified biopolymer of claim 4.

8. A polymeric matrix structure comprising the modified biopolymer of claim 4.

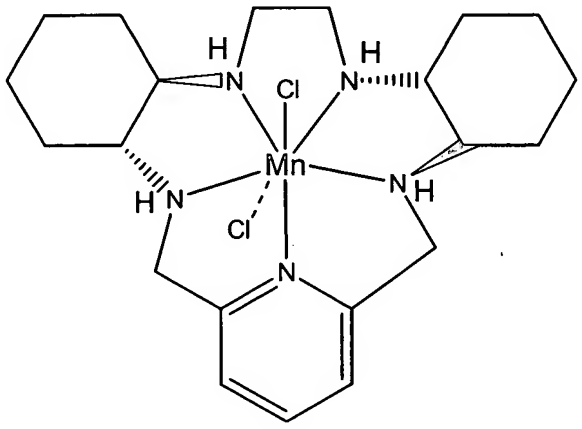
9. A nerual growth guide channel comprising the modified biopolymer of claim 4.

10. A method for in vivo regrowth of nerve tissue in a subject in need thereof comprising placement of the neural growth guide channel of claim 9 in the subject under conditions sufficient to stimulate regrowth of nerve tissue.

11. The modified biopolymer of claim 2, wherein the non-proteinaceous catalyst capable of dismutating superoxide comprises a reactive moiety to provide a means for covalent conjugation to the unmodified biopolymer.

12. The modified biopolymer of claim 11, wherein the reactive moiety is chosen from the group consisting of amino, carboxyl, isocyanate, mercapto, hydroxy, silyl chloride, acid halide, halide, glycidyl, and substituted or unsubstituted alkenyl, alkynyl, and aryl.

13. The modified biopolymer of claim 2, wherein the non-proteinaceous catalyst capable of dismutating superoxide is chosen from the group consisting of:



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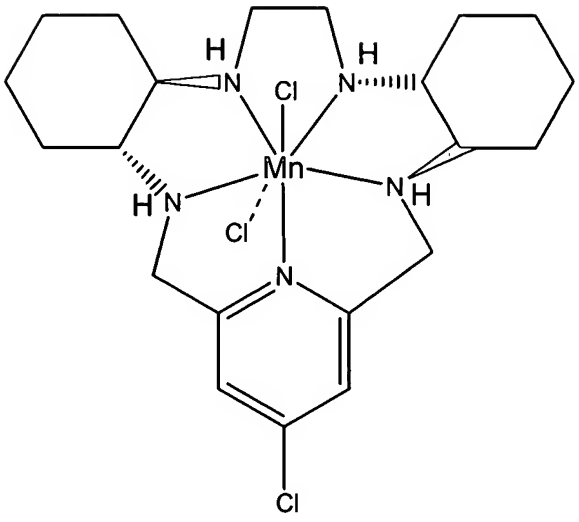
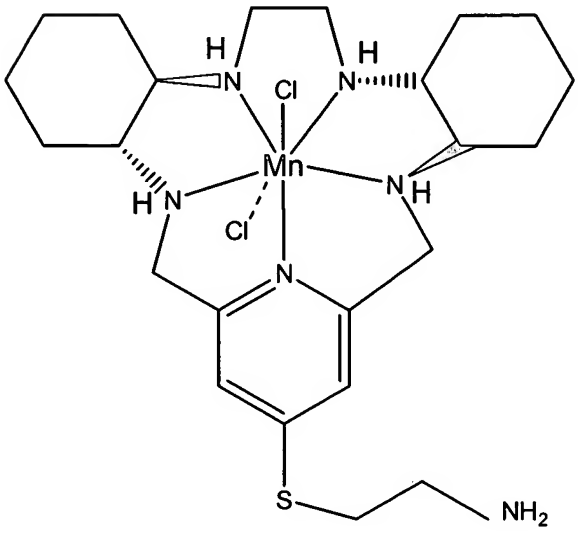
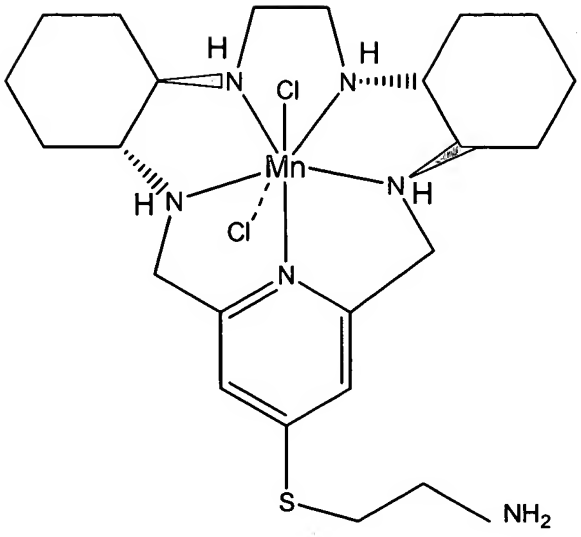


; and



14. Modified hyaluronic acid prepared by reaction of hylauronic acid with a non-proteinaceous catalyst capable of dismutating superoxide having the structure:



or a precursor ligand thereof under conditions appropriate to covalently attach the non-proteinaceous catalyst capable of dismutating superoxide to the hyaluronic acid.

15. A pharmaceutical composition comprising the modified biopolymer of claim 1 and a pharmaceutically acceptable carrier or diluent.

16. A pharmaceutical composition comprising the compound of claim 13 and a pharmaceutically acceptable carrier or diluent.

17. A pharmaceutical composition comprising the modified hyaluronic acid of claim 14 and a pharmaceutically acceptable carrier or diluent.

18. A method for treating joint pain in a subject in need thereof comprising administering to the subject the pharmaceutical composition of claims 15, 16, or 17.

19. A method for treating osteoarthritis in a subject in need thereof comprising administering to the subject the pharmaceutical composition of claims 15, 16, or 17.

20. A method for treating inflammation in a subject in need thereof comprising administering to the subject the pharmaceutical composition of claims 15, 16, or 17.

21. The method of claim 18, wherein the pharmaceutical composition is administered to the subject by injection.

22. The method of claim 19, wherein the pharmaceutical composition is administered to the subject by injection.

23. The method of claim 20, wherein the pharmaceutical composition is administered to the subject by injection.